

Attorney's Docket No.: 06618/733001 / CIT 3338

REMARKS

Reconsideration and allowance of the above referenced application are respectfully requested.

The drawings stand objected to as including numbers which were not disclosed in the specification. Number 116 has been removed from figure 1 in a separate, request for drawing change.

A description of elements 280 and 290 have been added, based on the disclosure of original claim 3.

A paragraph has been added to the specification based on disclosure of original claim 3, to support the wicking part.

Claim 5 stands objected to due to an informality which has been corrected herein.

Claims 10-13 stand rejected based on lack of antecedent basis for a catalyst layer coating of line 4. This has been corrected herein.

Initially, the indication that claim 6 allowable is appreciatively noted. This claim is retained herein.

Claims 1, 4 and 5 stand rejected under 35 USC 102 as allegedly being anticipated by U.S. patent No. 5,108,849, issued to Watkins. Claims 1 and 5 have been amended to emphasize their patentable distinctions, and specifically to make it more clear that the membranes are actually electrochemically active cells.

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This is very different than Watkins, who teaches a fuel cell flow field plate. The flow field plate is simply a plate that receives methanol, and couples it to the membrane electrode assembly of the fuel cell. Watkins teaches only a single membrane electrode assembly in figure 1. Therefore, this is completely different than claim 1 as amended.

As such, it is respectfully suggested that claims 1 and 5, each of which describe a plurality of membrane assemblies connected to one another, are not in any way taught or suggested by Watkins.

The dependent claims should be allowable for similar reasons to those given above. In addition, however, it is respectfully suggested that Watkins has no interconnects whatsoever, and therefore the statement in the official action about the material of the interconnects must necessarily then be incorrect. There is only a single fuel cell element recited in Watkins, and hence there are no interconnects between adjacent electrodes as claimed.

Claims 1-5 stand rejected under 35 USC 102b as allegedly being unpatentable over Tsukui. Tsukui teaches a fuel cell using an organic electrolyte. However, while Tsukui does teach parallel membranes, he certainly does not teach or suggest the features of amended claims 1 and 5 in which a plurality of

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electrochemical cells are connected together. Therefore, it is respectfully suggested that the amendment to these claims obviates the rejection.

Again, the dependent claims should be allowable for similar reasons. Claim 3 specifies the methanol feed part being a wick. While Tsukui does teach a wick, the wick feeds the methanol to the surface of the fuel cell. The Tsukui does not teach or suggest feeding methanol to edges of the membranes of the multiple interconnected fuel cells as claimed.

Claim 10 stands rejected under 35 USC 103 as allegedly being on patentable over Mayer in view of Kato. Claims 11 and 12 stand rejected based on Mayer in view of Kato and Watkins, and claim 13 stands rejected based on Mayer in view of Kato and Feigenbaum. All of these contentions have been obviated by the amendment of claim 10 to include the limitations of claim 12 therein. As amended claim 10 specifies a fuel cell in which the binder is cured by heat treating during hot pressing. This, however, is respectfully traversed, since it is respectfully suggested that Mayer teaches a heat curable resin which is carbonized. Nothing in this hypothetical combination of references teaches or suggests any of these features.

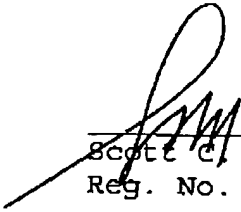
The dependent claims should be allowable for similar reasons to those discussed above with respect to claim 10.


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In view of the above amendments and remarks, therefore, all of the claims should be in condition for allowance. A formal notice of allowance is hence respectfully solicited.

Please apply any charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Attached is a marked-up version of the changes being made by the current amendment.

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Version with markings to show changes made

In the specification:

On page 3, after line 3, add the following new paragraph:

The methanol may be fed to the fuel cells using a wicking part 290 which feeds methanol from a methanol fuel supply 208 to edges of the membranes of the electrochemical cells.

Please replace the paragraph beginning at page 4, paragraph [0015] with the following rewritten paragraph:

The electrodes of the first embodiment may allow [use] current to flow along the length of the electrodes. The effective path length for the current flow may be given by one arbitrary unit for each 1 cm x 1cm section of the electrode. Thirty units of path length may be used for the six cell pack. For example, all the current through the cells passes through an interconnect area of approximately 0.15 cm<sup>2</sup>. The ratio of the interconnect area to the electrode area is approximately 0.03. Moreover, the pack has a resistance of about 9.6 ohms.

Please replace the paragraph beginning at page 4, paragraph [0016] with the following rewritten paragraph:

In the figure 1 embodiment, the current flow from a first unit 100 occurs in the direction of the arrow 102. In the

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embodiment, a common membrane may be used, or membrane[s] parts may be connected.

In the claims:

Please amend the claims as follows:

1. (Amended) A fuel cell, comprising:  
a plurality of electrochemical cells, each including an electrochemical anode, an electrochemical cathode and a membrane[s], said plurality of electrochemical cells arranged in series such that current flows across said membranes;  
a plurality of electrodes, associated with the [membranes] electrochemical cells; and  
a plurality of interconnects, between two adjacent electrodes, and wherein each interconnect is at least 20 percent of an area of at least one of said electrodes.
2. (Amended) A fuel cell as in claim 1, further comprising a methanol feed part which feeds methanol to said [membranes] plurality of electrochemical cells.
3. (Amended) A fuel cell as in claim 1, wherein said methanol feed part is a wicking part which feeds methanol to edges of said membranes of said electrochemical cells.

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4. (Amended) A fuel cell as in claim 1, wherein said membranes are formed of a planar structure, and said interconnects are also formed of planar structures of substantially the same size as said [membranes].

5. (Amended) A fuel cell, comprising:  
a plurality of membrane[s] assemblies, arranged substantially [parallel] adjacent to one another, each membrane assembly being electrochemically active to produce a voltage when an electrochemical reaction occurs;

a plurality of electrodes, in contact with said membrane[s] assemblies; and

a plurality of interconnects, located between adjacent ones of said electrodes, wherein a ratio of an area of an interconnect to [a ratio of] an area of the electrodes is at least 0.2.

6. A fuel cell as in claim 5, wherein said ratio is substantially 0.2.

7. A fuel cell as in claim 5, wherein said interconnects are formed of a paste.

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8. A fuel cell as in claim 7, wherein said paste includes graphite therein.

9. A fuel cell as in claim 7, wherein said paste includes graphite herein and a heat curing binder.

10. (Amended) A method of forming a fuel cell, comprising:

forming a plurality of [membranes] assemblies which are substantially [parallel] adjacent with one another;  
coating said membranes with [the] a catalyst layer coating;  
forming interconnects of a paste with a heat curing binder therein, which curing binder is heated during said hot pressing,  
between electrodes associated with said membranes; and  
hot pressing said membranes and electrodes together  
during said hot pressing said electrodes to form a membrane electrode assembly.

11. (Amended) A method as in claim 10, wherein said interconnects are formed of [the] a paste with a graphite material therein.



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12. A method as in claim 10, wherein said interconnects are formed of a paste with a heat curing binder therein, which curing binder is heated during said hot pressing.

13. A method as in claim 10, further comprising applying said interconnect paste using a hypodermic syringe.

Please add the following new claims:

14. (New) A fuel cell as in claim 1, wherein said electrochemical cells are arranged such that an anode of one of said electrochemical cells contacts a cathode of another of said electrochemical cells.

15. (New) A fuel cell as in claim 14, wherein said electrochemical cells produce a voltage which travels along a

16. (New) A fuel cell as in claim 14, wherein said electrochemical cells produce a voltage which travels along a width of the cell.

17. (New) A fuel cell as in claim 5, wherein said membrane assemblies each include an anode part, a cathode part,

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and a membrane part, between said anode and notecards.

18. (New) A fuel cell as in claim 17, wherein said membrane assemblies produce a voltage which travels along a length of the membrane assemblies.

19. (New) A fuel cell as in claim 17, wherein said membrane assemblies produce a voltage which travels along a width of the membrane assemblies.